

Randi Jandt (UAF/AFSC)  
Eric Miller (AFS)  
Carson Baughman (USGS)  
Ben Jones (USGS)  
Ben Raevsky (AFS)



*Anaktuvuk R fire mid-July 2007:  
photo by Rick Reanier*

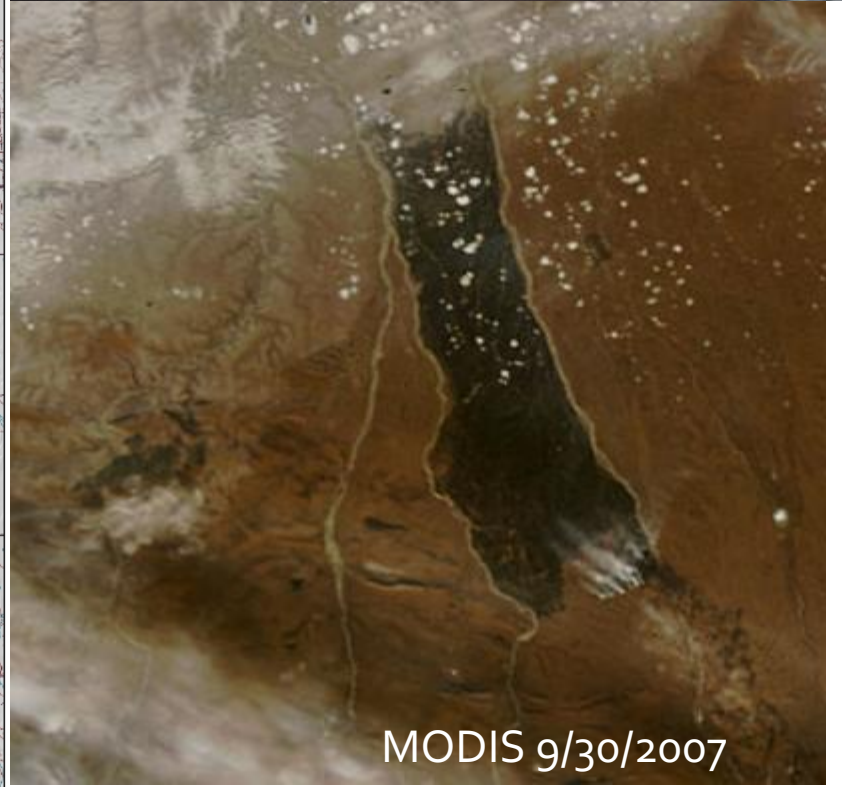
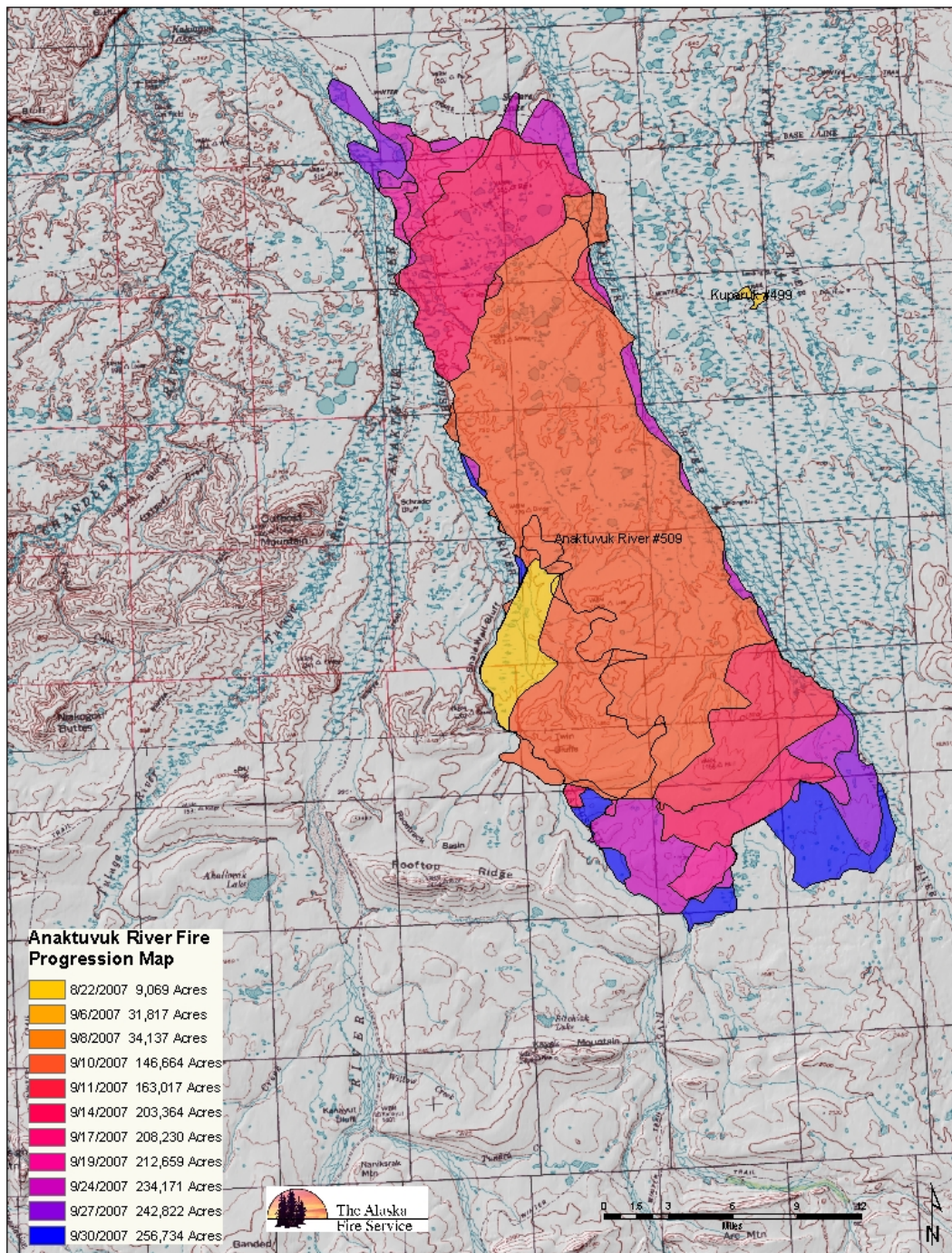
# Fire's Role in De-frosting the Arctic

Anaktuvuk River Fire re-survey: July 8-17, 2017



*NASA ABoVE Science Meeting, January 2018*

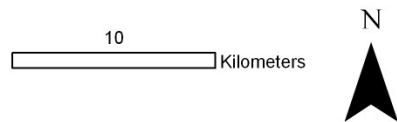




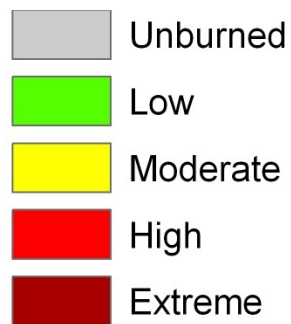
MODIS 9/30/2007



# Burn Severity Classes 2007 Anaktuvuk River Fire



Kuparuk Fire:  
low severity



Map by C. Kolden, USGS





ARF63

1m

7-7-08



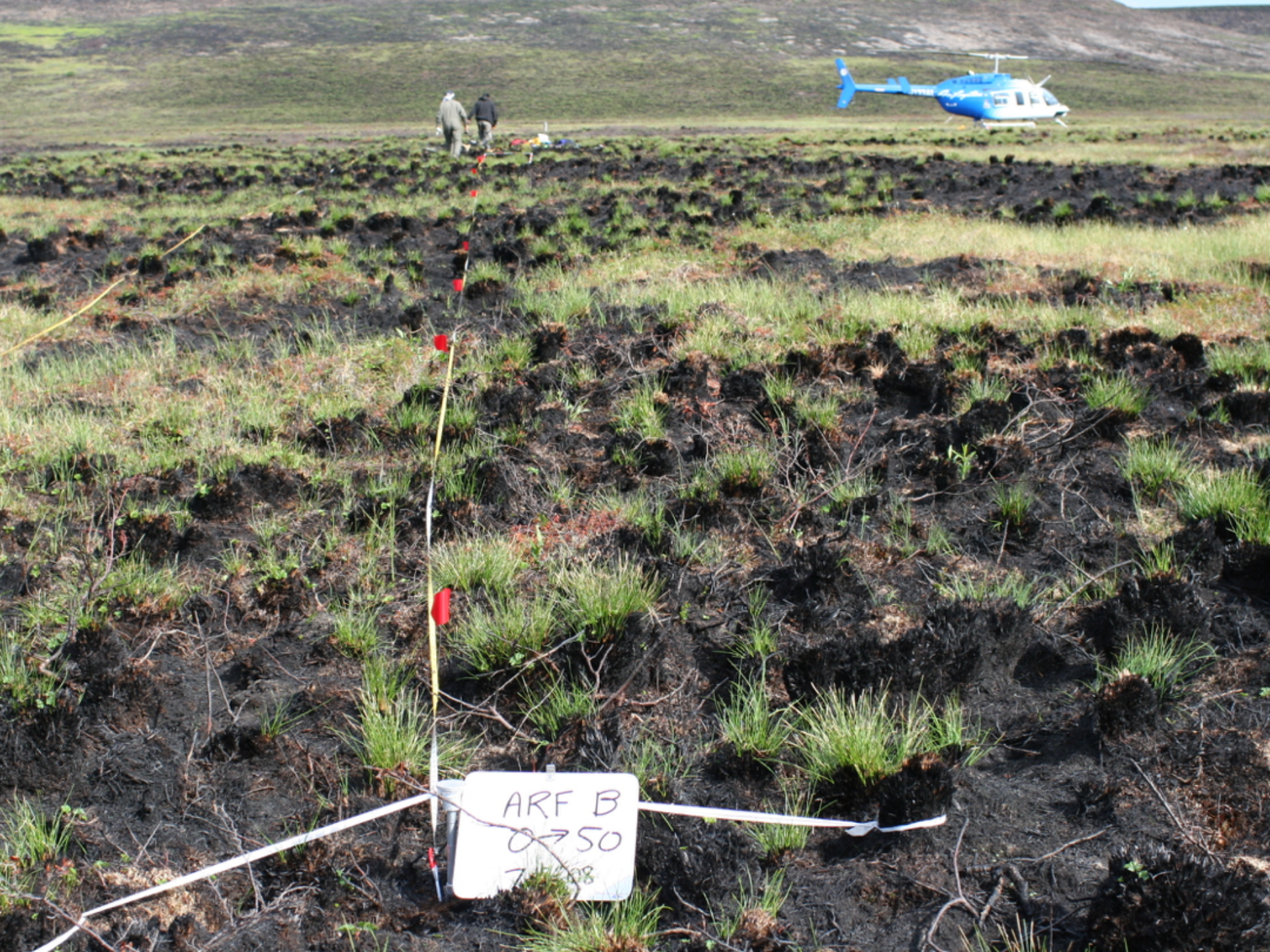












ARF B  
0-50  
7-108



ARE-B  
15 m  
7-16-09



ARE-C  
15 m  
7-16-09





Past collaborators:

Dave Yokel (BLM)

Chuck and Marilyn Racine

Teresa Hollingsworth (USFS/UAF)

Jack Ahgook Jr (Anaktuvuk Pass)

Michelle Mack (NAU)

Donie Bret-Harte (UAF Arctic LTER)

Janet Jorgenson, USFWS Arctic Refuge

## 2017 Funding:

BLM Alaska Fire Service

BLM Arctic District Office

USGS Alaska Science Center





# Ice feature degradation in burn







2011



2017



2017



AFRB  
7-9-17  
15m



AFRB 15m  
2008

2017/07/09





2017/07/14







2017 Transect is now 51.8 m long!



Stake

Thaw pond

2017/07/11



# Subsidence greatest in yedoma-underlain soils

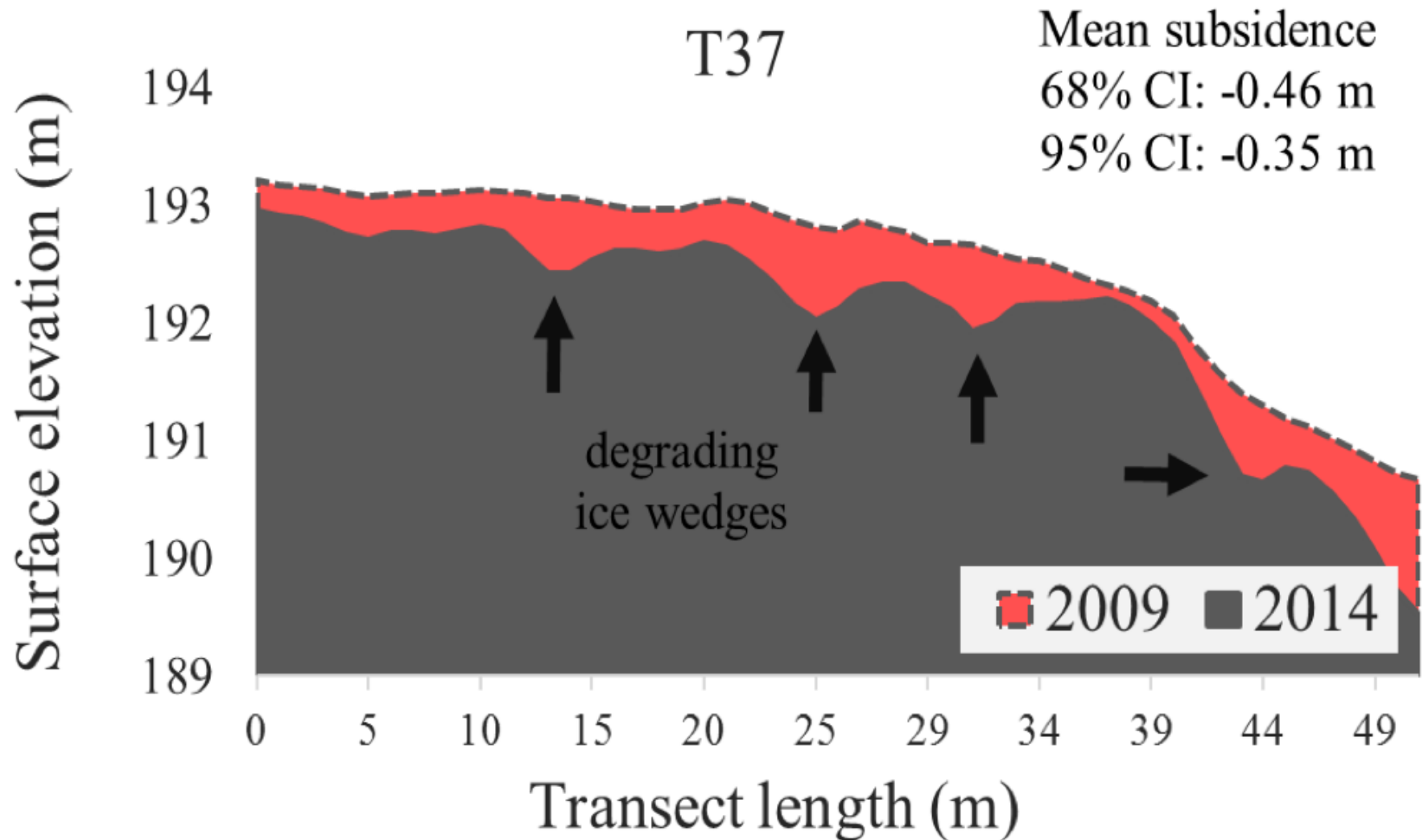


Figure: Carson Baughmann



2008

# 2007 Kuparuk Burn

2017





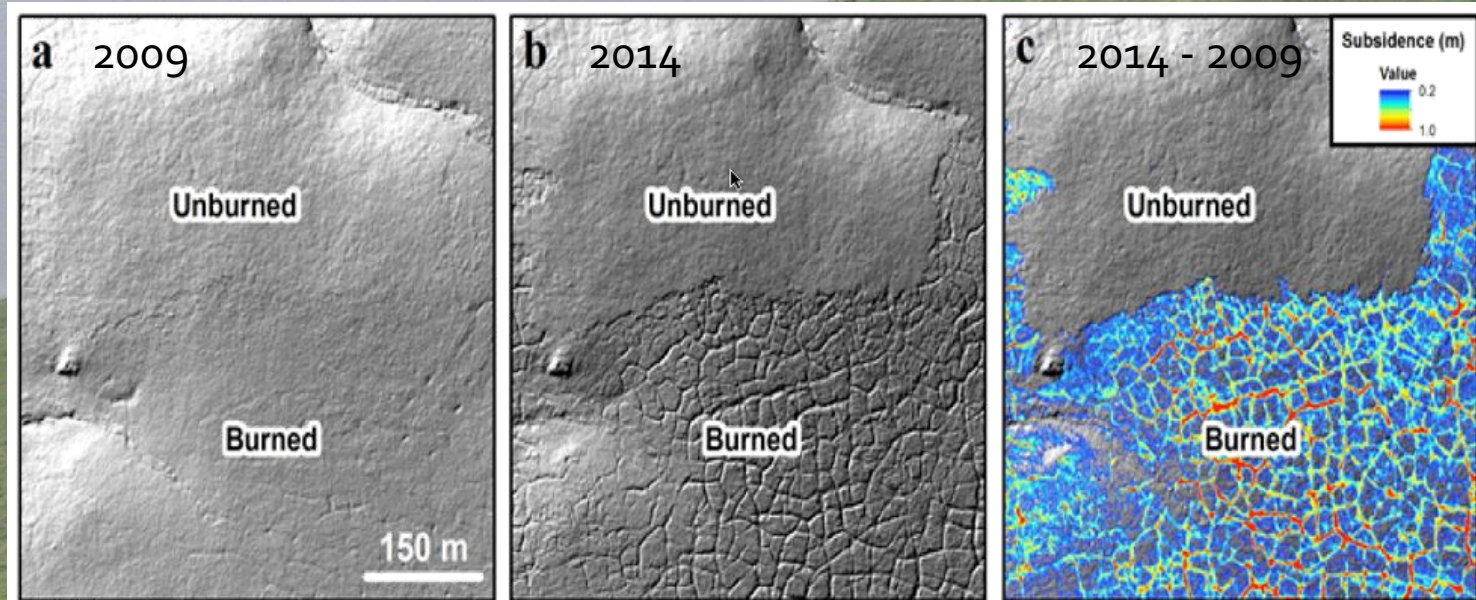
2008



2017







Jones, BM.; Grosse, G; Arp, CD.; Miller, E, Liu, L; Hayes, DJ; Larsen, CF.  
2015. Scientific Reports 5:15865

Red = 1 m  
of surface  
subsidence.

Up to 340%  
increase in  
rugosity.

2017/07/16



# Soil temperatures in burn much warmer: Degree days above freezing at 15 cm depth

10 yr-old burn has:

- 2.7 times as many degree days above 0°C
- 360 more degree days per year. (573 vs 213)
- Frost-free season 13 days longer

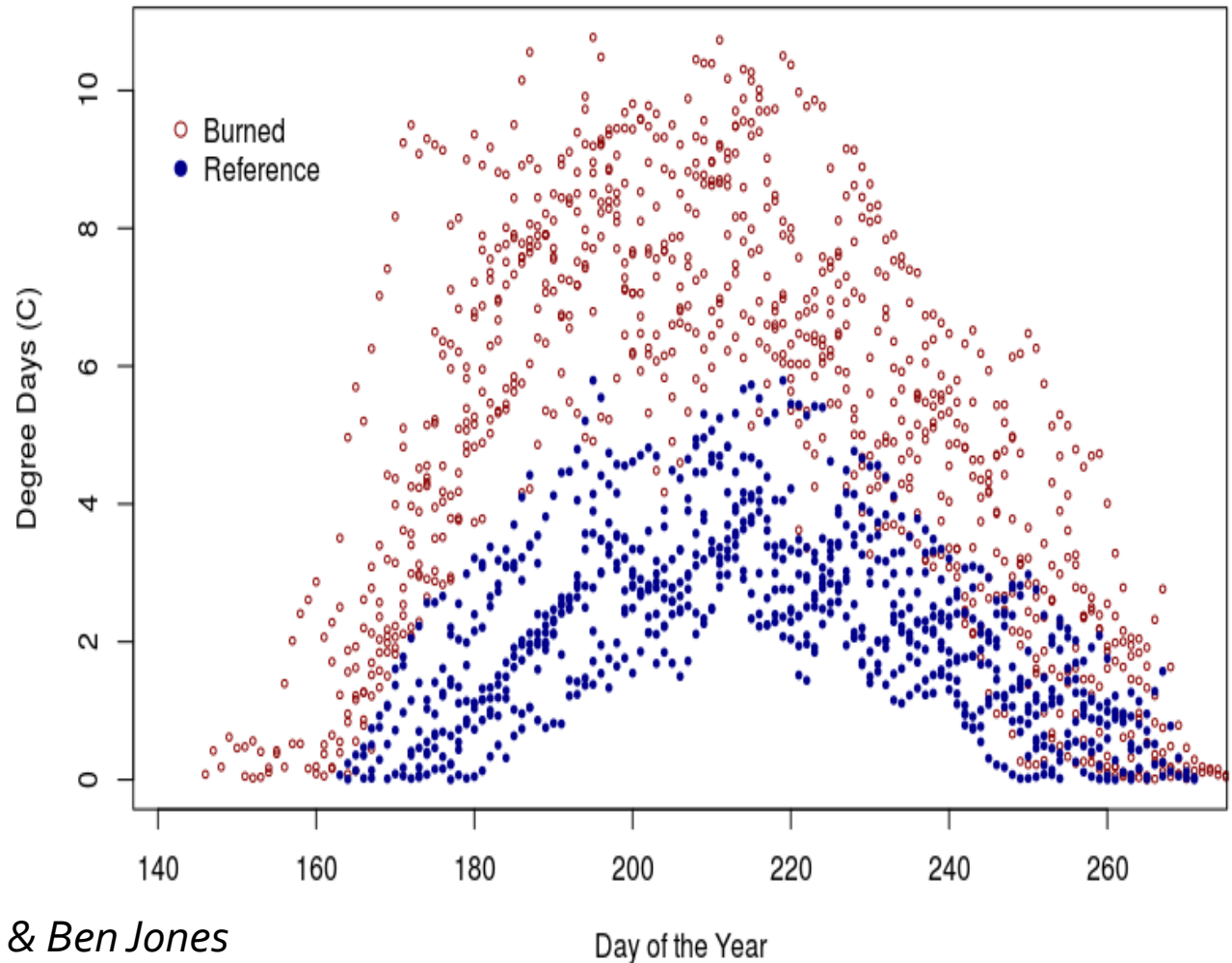


Figure: Carson Baughmann & Ben Jones  
USGS-Alaska



The burn has lush vegetation again . . .  
but it's not the same?



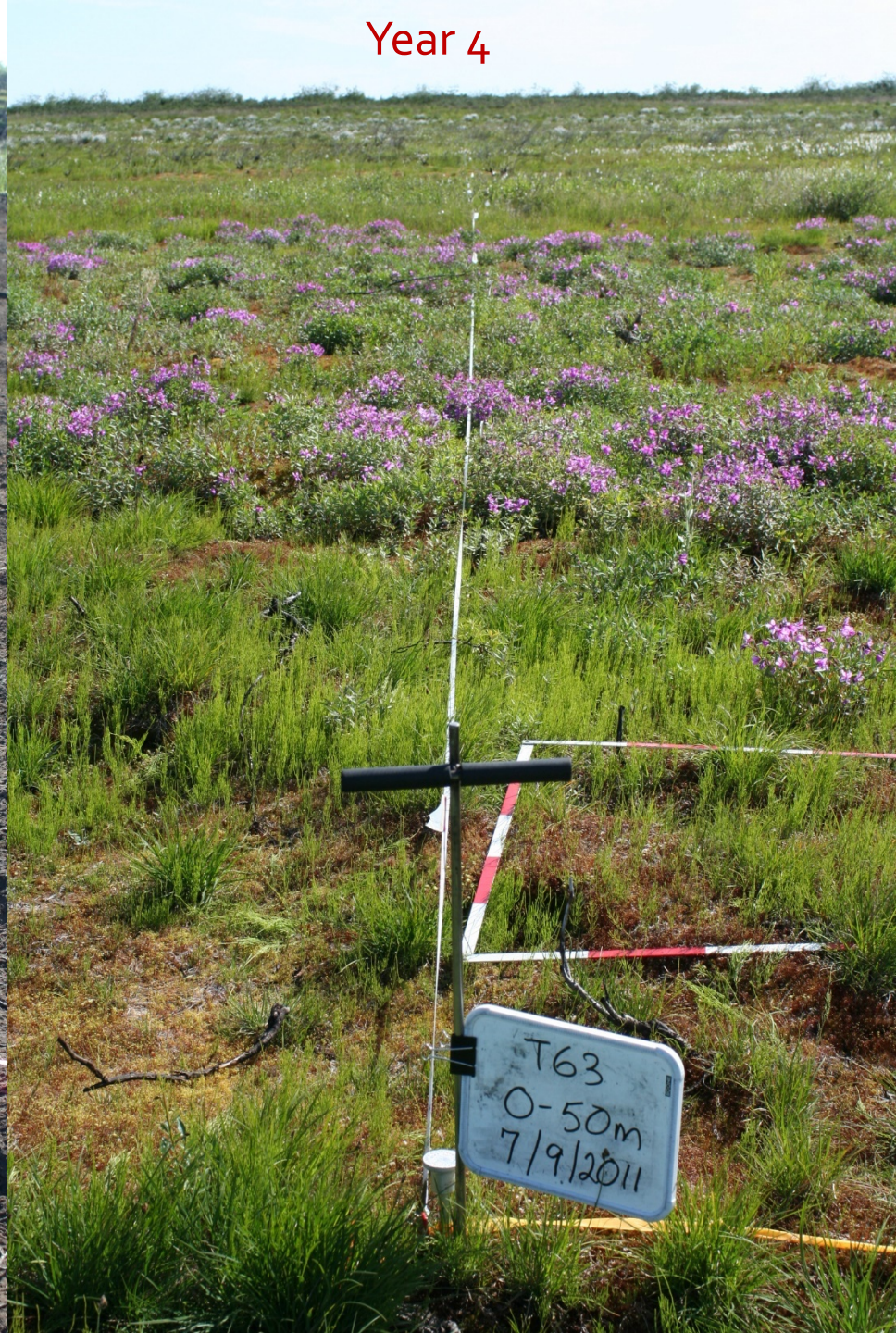
2017/07/14



Post-Burn



Year 4





Year 10



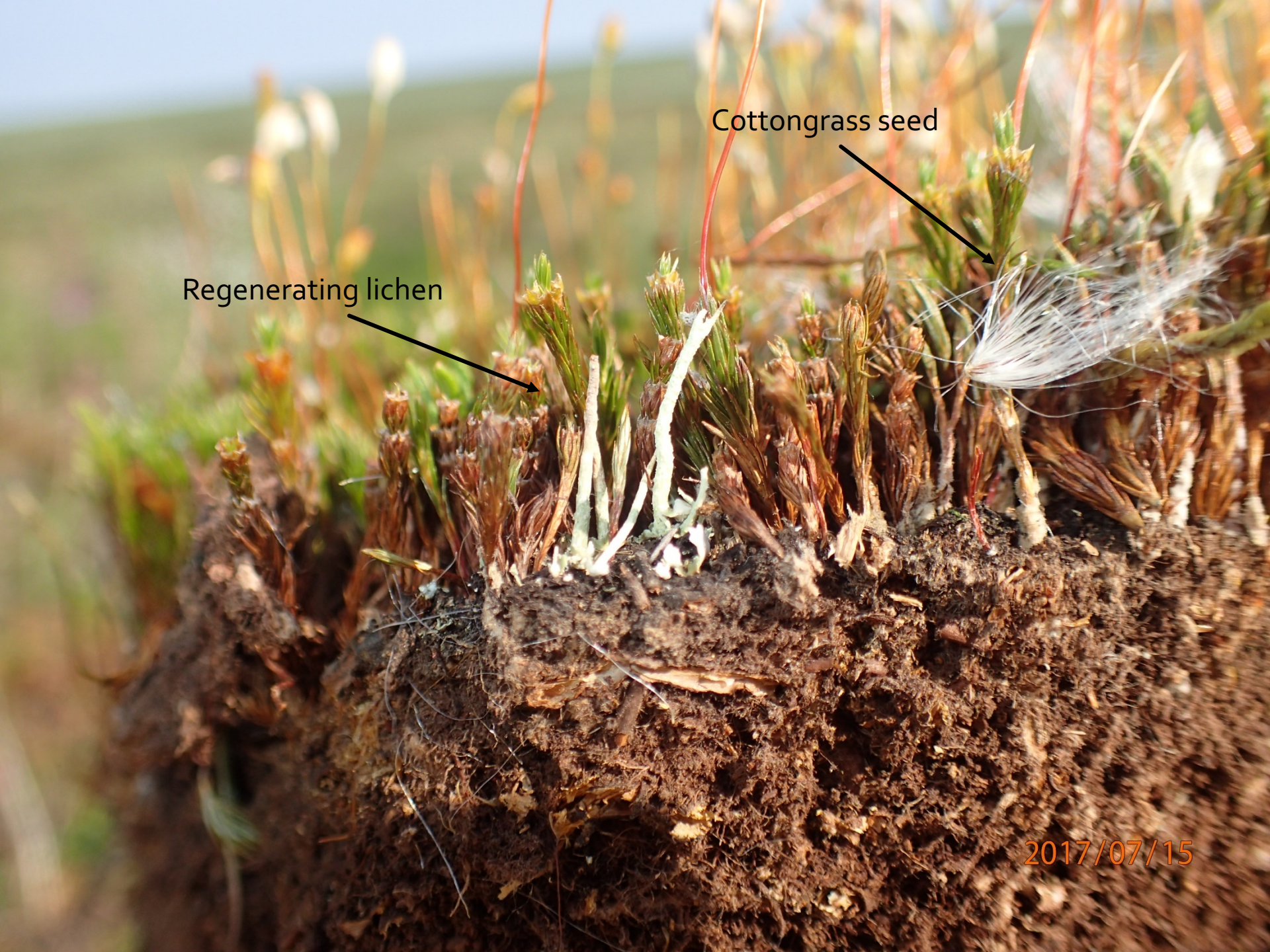
2017/07/08



Cottongrass seed

Regenerating lichen

2017/07/15







ARF T41  
7-11-2017  
50→0

2017/07/11





2017/07/08





10 years moss  
duff  
accumulation

2017/07/16

WP197

2017/07/14





T69  
1817  
5m

2017/07/08





2017/07/08



# Positive feedbacks to warming and thawing from changed plant communities and surface topology?

Burned

Unburned

2017/07/15



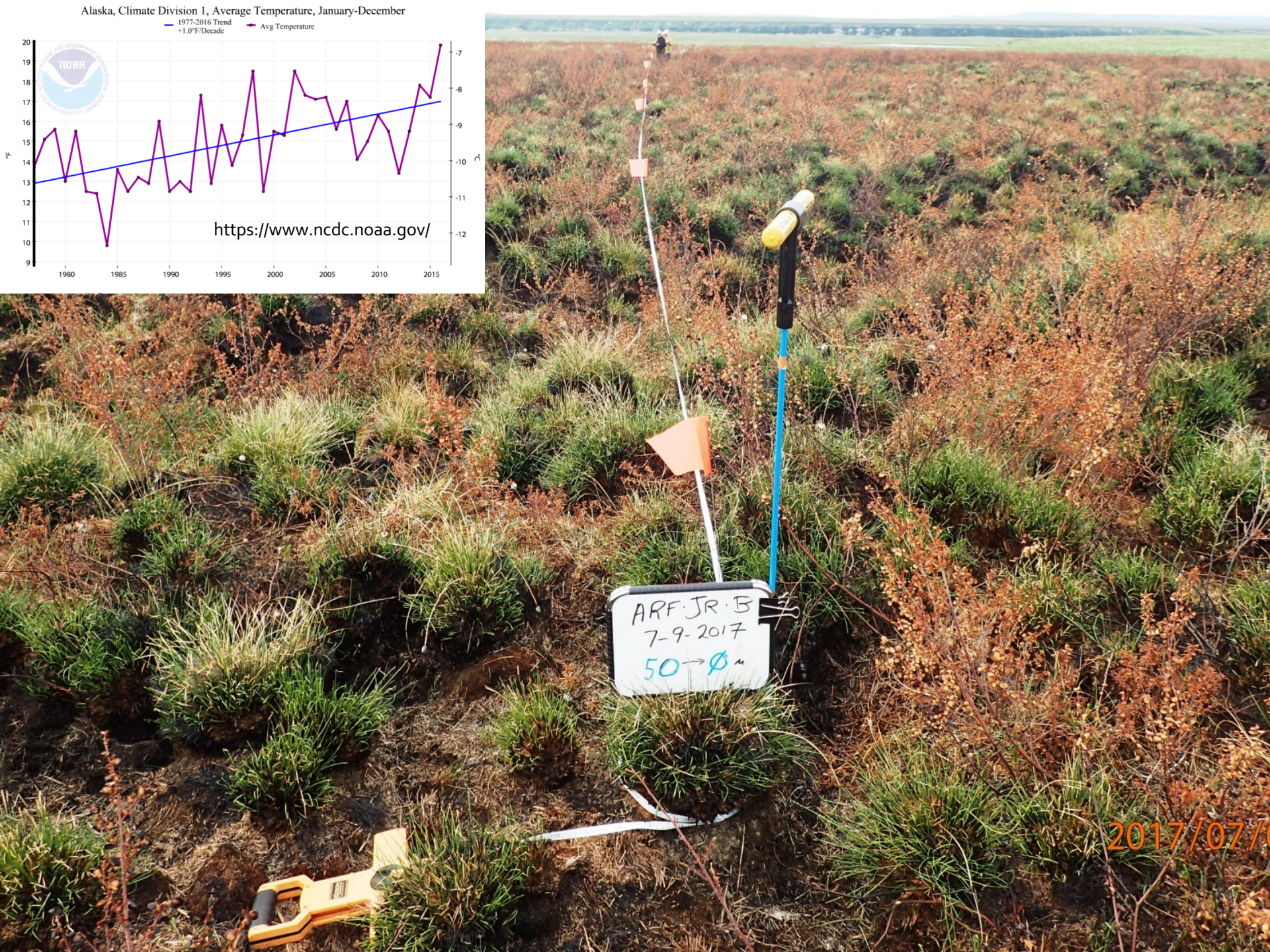
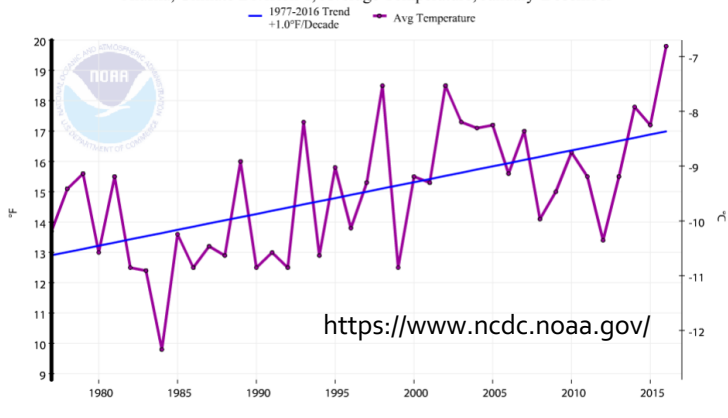


# First documented repeat burns on North Slope

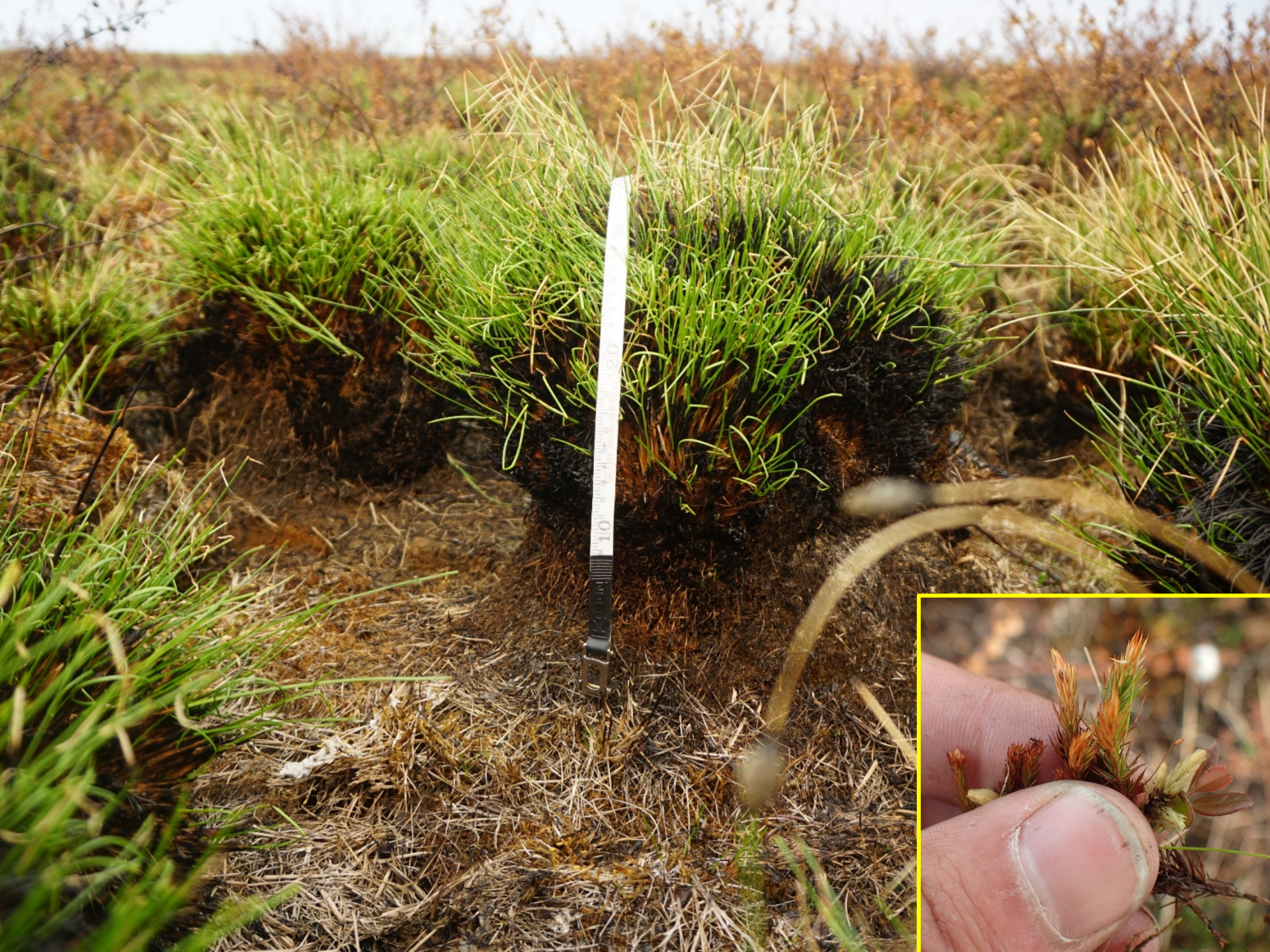




Alaska, Climate Division 1, Average Temperature, January-December









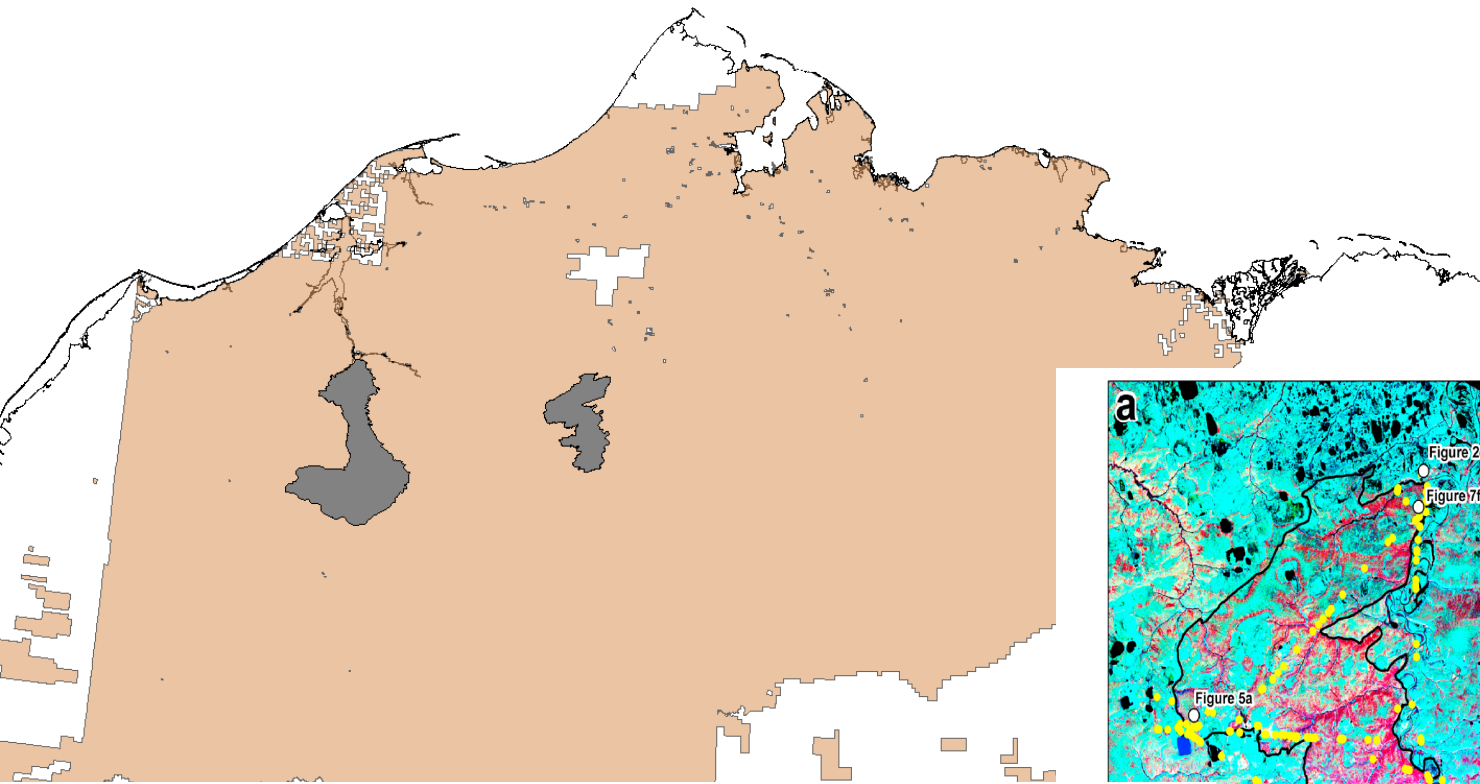


*Rite in the Rain*  
ALL-WEATHER  
JOURNAL  
No. 9902

2016 —



# Changes induced by fire appear to be persistent in arctic Alaska



1880-1920 fires

2013 JGR:  
BIOGEOSCIENCES,  
VOL. 118, 1334–1344

## Identification of unrecognized tundra fire events on the north slope of Alaska

Benjamin M. Jones,<sup>1</sup> Amy L. Breen,<sup>2</sup> Benjamin V. Gaglioti,<sup>1,3</sup> Daniel H. Mann,<sup>4</sup> Adrian V. Rocha,<sup>5</sup> Guido Grosse,<sup>6</sup> Christopher D. Arp,<sup>3</sup> Michael L. Kunz,<sup>7</sup> and Donald A. Walker<sup>8</sup>

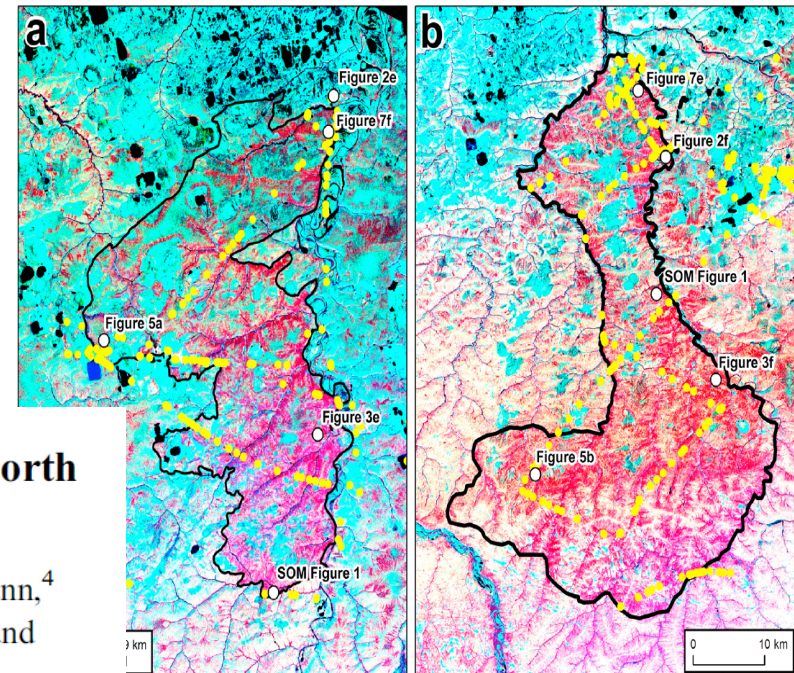


Figure 4. Enhanced Landsat images of the (a) Meade River and (b) Ketik River sites.



Shrubification: "Jones Burn" c. 1948  
Unburned transect



Three willow  
species



Shrubbification: "Jones Burn" c. 1948  
Burned transect



Five willow  
species





69+ years post-  
burn

Willow basal area  
is 6.8X greater

Jones Burn  
7.16.17  
0-50m



# The End

Acknowledgements: Bureau of Land Management, Alaska Fire Service & Arctic District Office; USGS Alaska Science Center; Joint Fire Science Program; State of Alaska DNR; UAF Institute of Arctic Biology Toolik Field Station, Helicopter pilot Dave McKnight

Discussion point:  
can fire accelerate the  
changes in the arctic  
that climate is already  
inducing and could a  
single fire event  
trigger a threshold  
change in arctic  
vegetation  
communities, with  
far-reaching  
implications?





